CLAIMS

We claim:

1. A method for producing a decellularized tissue engineered construct comprising the steps of:

providing a tissue engineered construct; and

decellularizing the tissue engineered construct, thereby forming a decellularized tissue engineered construct.

2. The method of claim 1, wherein the providing step comprises producing a tissue engineered construct, and wherein producing a tissue engineered construct comprises the steps of:

contacting a substrate with a population of cells capable of adhering thereto, thereby forming a cell-seeded construct; and

maintaining the cell-seeded construct under conditions suitable for growth of the population of cells for a growth period to form a tissue engineered construct.

3. The method of claim 1, wherein the providing step comprises producing a tissue engineered construct, and wherein producing a tissue engineered construct comprises the steps of:

contacting a substrate with a first population of cells capable of adhering thereto, thereby forming a primary cell-seeded construct; and

maintaining the cell-seeded construct under conditions suitable for growth of the first population of cells for a first growth period to form a primary tissue engineered construct;

contacting the primary tissue engineered construct with a second population of cells, thereby forming a secondary cell-seeded construct; and

maintaining the secondary cell-seeded construct under conditions suitable for growth of the second population of cells for a second growth period.

4. The method of claim 2, wherein the contacting and maintaining steps are repeated alternately until a cell-seeded construct having desired properties is formed.

5. The method of claim 4, wherein the contacting step is repeated using a plurality of different cell types.

6. The method of claim 2, wherein the substrate comprises a biocompatible material.

7. The method of claim 2, wherein the substrate comprises a porous material.

8. The method of claim 2, wherein the substrate comprises a collagen sponge.

9. The method of claim 2, wherein the substrate comprises a polymeric material.

10. The method of claim 2, wherein the substrate comprises a length of tubing.

11. The method of claim 10, wherein the length of tubing is coated.

12. The method of claim 2, wherein the substrate comprises a synthetic polymeric material.

13. The method of claim 12, wherein the synthetic polymeric material has a hydrophilic surface.

14. The method of claim 12, wherein the polymeric material comprises a polymer selected from the group consisting of polyesters of hydroxycarboxylic acids, polyanhyrides of dicarboxylic acids, and copolymers of hydroxy carboxylic acids and dicarboxylic acids.

15. The method of claim 2 wherein the substrate has an inner and outer surface, wherein the inner surface of the substrate defines a lumen.

16. The method of claim 2 wherein the substrate comprises a flat surface.

17. The method of claim 2 wherein the substrate comprises a three-dimensional structure.

18. The method of claim 2, wherein a mechanical force is applied to the construct during the growth period.

19. The method of claim 2, wherein a pulsatile stimulus is applied to the construct during the growth period.

20. The method of claim 2, wherein pulsatile stretch is applied to the construct during the growth period.

21. The method of claim 2, wherein the growth period is continued until the construct reaches a predetermined thickness.

22. The method of claim 2, wherein the growth conditions are chosen to promote deposition of extracellular matrix components.

23. The method of claim 2, wherein the cells are selected from the group consisting of: smooth muscle cells, cardiac muscle cells, epithelial cells, endothelial cells, urothelial cells, fibroblasts, myoblasts, chondrocytes, chondroblasts, osteoblasts, osteoclasts, hepatocytes, bile duct cells, pancreatic islet cells, thyroid, parathyroid, adrenal, hypothalamic, pituitary, ovarian, testicular, salivary gland cells, adipocytes, and precursor cells.

24. The method of claim 2, wherein the cells are neonatal cells.

25. The method of claim 2, wherein the population of cells comprises cells of at least two cell types.

26. The method of claim 2, wherein the cells are human cells.

27. The method of claim 2, wherein the cells are porcine cells.

28. The method of claim 2, wherein the cells are tumor cells.

29. The method of claim 2, wherein the cells are genetically transformed cells.

30. The method of claim 1 or 2, wherein the decellularization step comprises:

incubating the construct in a processing solution, the processing solution extracting cells from the construct.

31. The method of claim 30, wherein the processing solution comprises at least one component selected from the list consisting of: a detergent, a hypotonic solution, an RNA nuclease, and a DNA nuclease.

32. The method of claim 1 or 2, wherein at least 50% of the cells are removed in the decellularization step.

33. The method of claim 1 or 2, wherein at least 60% of the cells are removed in the decellularization step.

34. The method of claim 1 or 2, wherein at least 70% of the cells are removed in the decellularization step.

35. The method of claim 1 or 2, wherein at least 80% of the cells are removed in the decellularization step.

36. The method of claim 1 or 2, wherein at least 90% of the cells are removed in the decellularization step.

37. The method of claim 1 or 2, wherein at least 95% of the cells are removed in the decellularization step.

38. The method of claim 1 or 2, wherein at least 99% of the cells are removed in the decellularization step.

39. The method of claim 1 or 2, wherein substantially all of the cells are removed in the decellularization step.

40. The method of claim 2, further comprising the step of:

removing a portion of the substrate.

41. The method of claim 2, further comprising the step of:

removing substantially all of the substrate.

42. The method of claim 2, further comprising the step of:

applying a fluid shear to the decellularized construct, thereby removing a portion of the substrate.

43. The method of claim 2, further comprising the step of:

applying a fluid shear to the decellularized construct, thereby removing substantially all of the substrate.

44. The method of claim 2, further comprising the step of:

storing the decellularized tissue engineered construct.

45. The method of claim 44, further comprising the step of:

before storing the decellularized construct, pretreating the decellularized construct with an agent selected to protect the decellularized construct during the storage process.

46. The method of claim 44, wherein the storing comprises cryopreservation.

47. The method of claim 46, wherein the decellularized construct comprises a proteinaceous matrix, and wherein the storing step comprises:

incubating the construct in a cryoprotective solution and freezing at cooling rates such that minimal functional damage occurs to the proteinaceous matrix of the construct to produce a cryoprepared construct;

drying the cryoprepared construct under temperature and pressure conditions that permit removal of water without substantial ice recrystallization or ultrastructural damage.

48. The method of claim 44, wherein the storing comprises drying.

49. The method of claim 44, further comprising the step of:

reconstituting the decellularized construct after storage.

50. The method of claim 49, wherein the reconstituting step comprises:

incubating the decellularized construct in a rehydration solution, the rehydration solution reducing osmotic, hypoxic, autolytic, or proteolytic damage.

51. The method of claim 49, wherein the reconstituting step comprises:

incubating the decellularized construct in a rehydration solution, the rehydration solution reducing microbial contamination.

52. The method of claim 44, further comprising the step of:

treating the decellularized construct with a biologically active agent.

53. The method of claim 52, wherein the biologically active agent is selected to stimulate recellularization of the construct.

54. The method of claim 52, wherein the biologically active agent is selected from the group consisting of: growth factors, adhesion factors, soluble extracellular matrix proteins, thrombomodulators, antibiotics, and agents that augment hemocompatibility.

55. The method of claim 1 or 2, further comprising the step of:

subjecting the decellularized construct to further tissue engineering.

56. The method of claim 1, wherein providing a tissue engineered construct comprises:

purchasing a tissue engineered construct.

57. The method of claim 1, wherein providing a tissue engineered construct comprises providing a tissue engineered construct that has been produced primarily by growth *in vitro*.

58. The method of claim 1, wherein providing a tissue engineered construct comprises providing a tissue engineered construct that has been produced at least in part by growth *in vivo*.

59. A method for treating a subject suffering from tissue damage or loss comprising:

producing a decellularized construct according to the method of claim 1 or 2; and

implanting the decellularized construct into a subject in need thereof.

60. The method of claim 59, wherein the implanting step comprises supplementing or replacing a blood vessel of the subject.

61. The method of claim 59, wherein the implanting step comprises supplementing or replacing a tissue of the subject, the tissue selected from the list consisting of: a heart valve, a muscle, a joint, a ligament, a tendon, a bone, and an organ.

62. A method for producing an engineered construct comprising the steps of:

producing a tissue engineered construct;

decellularizing the tissue engineered construct, thereby forming a decellularized construct;

contacting the decellularized construct with cells capable of adhering thereto, thereby forming a cell-seeded decellularized construct; and

maintaining the cell-seeded decellularized construct for a growth period in an environment suitable for growth of the cells to form an engineered construct.

63. The method of claim 62, wherein the producing step comprises:

contacting a substrate with a population of cells capable of adhering thereto, thereby forming a cell-seeded construct; and

maintaining the cell-seeded construct under conditions suitable for growth of the population of cells for a growth period to form a tissue engineered construct.

64. The method of claim 62, wherein the producing step comprises:

contacting a substrate with a first population of cells capable of adhering thereto, thereby forming a primary cell-seeded construct; and

maintaining the cell-seeded construct under conditions suitable for growth of the first population of cells for a first growth period to form a primary tissue engineered construct;

contacting the primary tissue engineered construct with a second population of cells, thereby forming a secondary cell-seeded construct; and

maintaining the secondary cell-seeded construct under conditions suitable for growth of the second population of cells for a second growth period.

65. The method of claim 62, wherein the cells comprise human cells.

66. The method of claim 62, wherein the cells comprise genetically transformed cells.

67. The method of claim 62, wherein the cells are obtained by harvesting cells from a subject, the subject being the intended recipient of the tissue engineered construct.

68. The method of claim 62, wherein the cells are selected from the group consisting of: smooth muscle cells, cardiac muscle cells, epithelial cells, endothelial cells, urothelial cells, fibroblasts, myoblasts, chondrocytes, chondroblasts, osteoblasts, osteoclasts, hepatocytes, bile duct cells,

pancreatic islet cells, thyroid, parathyroid, adrenal, hypothalamic, pituitary, ovarian, testicular, salivary gland cells, adipocytes, and precursor cells.

69. The method of claim 68, wherein the cells comprise cells of at least two different cell types.

70. The method of claim 63 or claim 64, further comprising the step of:

removing a portion of the substrate.

71. The method of claim 63 or claim 64, further comprising the step of:

removing substantially all of the substrate.

72. The method of claim 63 or claim 64, further comprising the step of:

applying a fluid shear to the decellularized construct, thereby removing a portion of the substrate.

73. The method of claim 63 or claim 64, further comprising the step of:

applying a fluid shear to the decellularized construct, thereby removing substantially all of the substrate.

74. The method of claim 62, further comprising the step of:

after decellularizing the tissue engineered construct to obtain a decellularized construct, storing the decellularized construct under conditions selected to preserve the construct.

75. The method of claim 74, further comprising the step of:

before storing the decellularized construct, pretreating the decellularized construct with an agent selected to protect the construct during the storage process.

76. The method of claim 74, wherein the storing comprises cryopreservation.

77. The method of claim 74, wherein the storing comprises drying.

78. The method of claim 74, further comprising the step of:

reconstituting the decellularized construct after storage.

79. The method of claim 78, further comprising the step of:

treating the decellularized construct with a biologically active agent.

80. The method of claim 79, wherein the biologically active agent is selected to stimulate recellularization of the construct.

81. The method of claim 79, wherein the biologically active agent is selected from the group consisting of: growth factors, adhesion factors, soluble extracellular matrix proteins, thrombomodulators, antibiotics, and agents that augment hemocompatibility.

82. A method for producing a decellularized engineered native tissue comprising the steps of:

procuring a tissue harvested from an animal or human;

engineering the harvested tissue, thereby forming an engineered native tissue; and

decellularizing the engineered native tissue, thereby forming a decellularized engineered native tissue.

83. The method of claim 82, wherein the engineering step comprises:

seeding the harvested native tissue with cells; and

maintaining the tissue under conditions suitable for growth of the cells for a growth period.

84. The method of claim 82, wherein the engineering step comprises:

subjecting the harvested tissue to a mechanical force, the mechanical force selected to enhance the properties of the tissue.

85. The method of claim 82, wherein the engineering step comprises:

subjecting the harvested tissue to an electrical stimulus.

86. The method of claim 82, wherein the engineering step comprises:
subjecting the harvested tissue to a pulsatile stimulus.

87. The method of claim 82, wherein the engineering step comprises:
treating the harvested tissue with a biologically active agent.

88. The method of claim 87, wherein the biologically active agent is selected from the list consisting of: growth factors, adhesion factors, soluble extracellular matrix proteins, thrombomodulators, antibiotics, and agents that augment hemocompatibility.

89. The method of claim 87, wherein the biologically active agent comprises:
a pharmaceutical composition.

90. The method of claim 82, wherein the harvested tissue comprises a blood vessel.

91. The method of claim 82, wherein the harvested tissue comprises a heart valve.

92. The method of claim 82, wherein the harvested tissue comprises an organ or a portion thereof.

93. The method of claim 82, wherein the harvested tissue comprises a muscle.

94. The method of claim 82, further comprising the step of:
subjecting the decellularized engineered native tissue to further tissue engineering.

95. The method of claim 82, further comprising the step of:
seeding the decellularized engineered native tissue with cells.

96. The method of claim 95 wherein the cells are selected from the group consisting of: smooth muscle cells, cardiac muscle cells, epithelial cells, endothelial cells, urothelial cells, fibroblasts, myoblasts, chondrocytes, chondroblasts, osteoblasts, osteoclasts, hepatocytes, bile duct cells, pancreatic islet cells, thyroid, parathyroid, adrenal, hypothalamic, pituitary, ovarian, testicular, salivary gland cells, adipocytes, and precursor cells.

97. The method of claim 95, wherein the cells comprise cells of at least two different cell types.

98. The method of claim 95, wherein the cells comprise neonatal cells.

99. The method of claim 95, wherein the cells comprise human cells.

100. The method of claim 95, wherein the cells comprise genetically transformed cells.

101. A method for treating a subject suffering from tissue damage or loss comprising the steps of:

producing an engineered, decellularized construct according to the method of claim 62; and

implanting the tissue engineered construct into a subject in need thereof.

102. The method of claim 101, wherein the cells used in the final contacting step are obtained by harvesting cells from the subject.

103. The method of claim 101, wherein the cells used in the final contacting step are obtained by a method comprising the steps of:

harvesting cells from the subject; and

culturing the cells *in vitro* prior to seeding the decellularized construct.

104. The method of claim 101, wherein the implanting step comprises supplementing or replacing a blood vessel of the subject.

105. The method of claim 101, wherein the implanting step comprises supplementing or replacing a tissue of the subject, the tissue selected from the list consisting of: a heart valve, a muscle, a joint, a ligament, a tendon, a bone, and an organ.

106. The method of claim 101, further comprising the step of:

treating the engineered, decellularized construct with a biologically active agent before the implanting step, whereby the construct serves as a vehicle for delivery of the biologically active agent to the subject.

107. The method of claim 106, further comprising the step of:

treating the engineered, decellularized construct with a biologically active agent before the implanting step, wherein the biologically active agent is selected to enhance recellularization or vascularization of the construct after the implanting step.

108. The method of claim 106, wherein the biologically active agent comprises a pharmaceutical composition.

109. The method of claim 106, wherein the biologically active agent is selected from the group consisting of: growth factors, adhesion factors, soluble extracellular matrix proteins, thrombomodulators, antibiotics, and agents that augment hemocompatibility.

110. An engineered tissue for use as a tissue engineering scaffold or for implanting into a subject comprising:

a decellularized engineered native tissue.

111. The engineered tissue of claim 110, wherein at least 50% of the cells are removed from the decellularized engineered native tissue by decellularization.

112. The engineered tissue of claim 110, wherein at least 60% of the cells are removed from the decellularized engineered native tissue by decellularization.

113. The engineered tissue of claim 110, wherein at least 70% of the cells are removed from the decellularized engineered native tissue by decellularization.

114. The engineered tissue of claim 110, wherein at least 80% of the cells are removed from the decellularized engineered native tissue by decellularization.

115. The engineered tissue of claim 110, wherein at least 90% of the cells are removed from the decellularized engineered native tissue by decellularization.

116. The engineered tissue of claim 110, wherein at least 95% of the cells are removed from the decellularized engineered native tissue by decellularization.

117. The engineered tissue of claim 110, wherein at least 99% of the cells are removed from the decellularized engineered native tissue by decellularization.

118. The engineered tissue of claim 110, further comprising a biologically active agent.

119. The engineered tissue of claim 110, wherein the biologically active agent is selected to enhance recellularization or vascularization of the tissue engineered construct.

120. The engineered tissue of claim 110, wherein the biologically active agent comprises a pharmaceutical composition.

121. The engineered tissue of claim 110, wherein the biologically active agent is selected from the group consisting of: growth factors, adhesion factors, soluble extracellular matrix proteins, thrombomodulators, antibiotics, and agents that augment hemocompatibility.

122. The engineered tissue of claim 110, wherein the engineered native tissue comprises native tissue that has been subjected to a mechanical force after removal from an animal or human source, wherein the mechanical force is selected to enhance the properties of the tissue.

123. The engineered tissue of claim 110, wherein the engineered native tissue comprises native tissue that has been subjected to electrical stimulation after removal from an animal or human source.

124. The engineered tissue of claim 110, wherein the engineered native tissue comprises native tissue that has been treated with a growth factor after removal from an animal or human source.

125. The engineered tissue of claim 110, wherein the engineered native tissue comprises native tissue that has been exposed to serum after removal from an animal or human source.

126. The engineered tissue of claim 110, wherein the engineered native tissue comprises native tissue that has been exposed to a pulsatile stimulus after removal from an animal or human source.

127. The engineered tissue of claim 110, further comprising:

a population of cells, wherein the decellularized engineered native tissue is seeded with the population of cells after decellularization.

128. The engineered tissue of claim 127, wherein the decellularized engineered native tissue is maintained under conditions suitable for growth of the cells for a growth period following seeding.

129. The engineered tissue of claim 127, wherein the cells comprise human cells.

130. The engineered tissue of claim 127, wherein the cells comprise porcine cells.

131. The engineered tissue of claim 127, wherein the cells comprise neonatal cells.

132. A construct for use as a tissue engineering scaffold or for implanting into a subject comprising:

a tissue engineered construct that has been subjected to decellularization.

133. The construct of claim 132, wherein the tissue engineered construct comprises a substrate seeded with cells and maintained under conditions suitable for growth of the cells for a growth period.

134. The construct of claim 133, wherein the growth period comprises a period of time sufficient for formation of a tissue engineered construct having a predetermined thickness.

135. The construct of claim 133, wherein at least 50% of the cells are removed from the tissue engineered construct by decellularization.

136. The construct of claim 133, wherein at least 60% of the cells are removed from the tissue engineered construct by decellularization.

137. The construct of claim 133, wherein at least 70% of the cells are removed from the tissue engineered construct by decellularization.

138. The construct of claim 133, wherein at least 80% of the cells are removed from the tissue engineered construct by decellularization.

139. The construct of claim 133, wherein at least 90% of the cells are removed from the tissue engineered construct by decellularization.

140. The construct of claim 133, wherein at least 95% of the cells are removed from the tissue engineered construct by decellularization.

141. The construct of claim 133, wherein at least 99% of the cells are removed from the tissue engineered construct by decellularization.

142. The construct of claim 132, further comprising a biologically active agent.

143. The construct of claim 132, wherein the biologically active agent is selected to enhance recellularization or vascularization of the tissue engineered construct.

144. The construct of claim 132, wherein the biologically active agent comprises a pharmaceutical composition.

145. The construct of claim 132, wherein the biologically active agent is selected from the group consisting of: growth factors, adhesion factors, soluble extracellular matrix proteins, thrombomodulators, antibiotics, and agents that augment hemocompatibility.

146. The construct of claim 132, wherein the tissue engineered construct comprises a tissue engineered construct that has been subjected to a mechanical force during a growth period.

147. The construct of claim 132, wherein the tissue engineered construct comprises a tissue engineered construct that has been subjected to a pulsatile stimulus during a first growth period.

148. The construct of claim 132, wherein the tissue engineered construct comprises a tissue engineered construct that has been subjected to electrical stimulation during a first growth period.

149. The construct of claim 132, wherein the tissue engineered construct comprises a tissue engineered construct that has been treated with a growth factor during a first growth period.

150. The construct of claim 132, wherein the tissue engineered construct comprises a tissue engineered construct that has been exposed to serum during a first growth period.

151. The construct of claim 133, wherein the substrate comprises a polymeric material.

152. The construct of claim 133, wherein the substrate comprises a length of tubing.

153. The construct of claim 133, wherein the length of tubing is coated.

154. The construct of claim 133, wherein the substrate comprises a synthetic polymeric material.

155. The construct of claim 133, wherein the polymeric material comprises a polymer selected from the group consisting of polyesters of hydroxycarboxylic acids, polyanhyrides of dicarboxylic acids, and copolymers of hydroxy carboxylic acids and dicarboxylic acids.

156. The construct of claim 133, wherein the substrate comprises a collagen sponge.

157. The construct of claim 133, wherein the substrate has an inner and outer surface, and wherein the inner surface of the substrate defines a lumen.

158. The construct of claim 133, wherein the substrate comprises a flat surface.

159. The construct of claim 133, wherein the substrate comprises a three-dimensional structure.

160. The construct of claim 133, wherein the construct is treated so as to remove substantially all of the substrate.

161. The construct of claim 133, wherein the cells are selected from the group consisting of: smooth muscle cells, cardiac muscle cells, epithelial cells, endothelial cells, urothelial cells, fibroblasts, myoblasts, chondrocytes, chondroblasts, osteoblasts, osteoclasts, hepatocytes, bile duct cells, pancreatic islet cells, thyroid, parathyroid, adrenal, hypothalamic, pituitary, ovarian, testicular, salivary gland cells, adipocytes, and precursor cells.

162. The construct of claim 133, wherein the cells comprise cells of at least two different cell types.

163. The construct of claim 133, wherein the cells comprise neonatal cells.

164. The construct of claim 133, wherein the cells comprise human cells.

165. The construct of claim 133, wherein the cells comprise porcine cells.

166. The construct of claim 133, wherein the cells comprise tumor cells.

167. The construct of claim 133, wherein the cells comprise genetically transformed cells.

168. A method for treating a subject suffering from tissue damage or loss comprising:

implanting the construct of claim 132 into a subject in need thereof.

169. The method of claim 168, further comprising the step of:

treating the construct with a biologically active agent before the implanting step, whereby the construct serves as a vehicle for delivery of the biologically active agent to the subject.

170. The method of claim 168, further comprising the step of:

treating the construct with a biologically active agent before the implanting step, whereby the biologically active agent is selected to enhance recellularization or vascularization of the construct after the implanting step.

171. The method of claim 168, wherein the biologically active agent comprises a pharmaceutical composition.

172. The method of claim 168, wherein the biologically active agent is selected from the group consisting of: growth factors, adhesion factors, soluble extracellular matrix proteins, thrombomodulators, antibiotics, and agents that augment hemocompatibility.

173. The method of claim 168, wherein the implanting step comprises supplementing or replacing a blood vessel of the subject.

174. The method of claim 168, wherein the implanting step comprises supplementing or replacing a tissue of the subject, the tissue selected from the list consisting of: a heart valve, a muscle, a joint, a ligament, a tendon, a bone, and an organ.

175. A method for treating a subject suffering from tissue damage or loss comprising:

implanting the engineered tissue of claim 110 into a subject in need thereof.

176. The method of claim 175, further comprising the step of:

treating the engineered tissue with a biologically active agent before the implanting step, whereby the engineered tissue serves as a vehicle for delivery of the biologically active agent to the subject.

177. The method of claim 175, further comprising the step of:

treating the engineered tissue with a biologically active agent before the implanting step, whereby the biologically active agent is selected to enhance recellularization or vascularization of the engineered tissue after the implanting step.

178. The method of claim 175, wherein the biologically active agent comprises a pharmaceutical composition.

179. The method of claim 175, wherein the biologically active agent is selected from the group consisting of: growth factors, adhesion factors, soluble extracellular matrix proteins, thrombomodulators, antibiotics, and agents that augment hemocompatibility.

180. The method of claim 175, wherein the implanting step comprises supplementing or replacing a blood vessel of the subject.

181. The method of claim 175, wherein the implanting step comprises supplementing or replacing a tissue of the subject, the tissue selected from the list consisting of: a heart valve, a muscle, a joint, a ligament, a tendon, a bone, and an organ.

182. A construct for use in tissue engineering or for implanting into a subject comprising:

a decellularized tissue engineered construct; and

a population of cells, wherein the decellularized tissue engineered construct is seeded with the population of cells.

183. The construct of claim 182, wherein the decellularized tissue engineered construct comprises a decellularized tissue engineered construct that has been subjected to a mechanical force during a growth period.

184. The construct of claim 182, wherein the decellularized tissue engineered construct comprises a decellularized tissue engineered construct that has been subjected to a pulsatile stimulus during a growth period.

185. The construct of claim 182, wherein the decellularized tissue engineered construct comprises a decellularized tissue engineered construct that has been subjected to electrical stimulation during a growth period.

186. The construct of claim 182, wherein the decellularized tissue engineered construct comprises a decellularized tissue engineered construct that has been treated with a growth factor during a growth period.

187. The construct of claim 182, wherein the decellularized tissue engineered construct comprises a decellularized tissue engineered construct that has been exposed to serum during a growth period.

188. The construct of claim 182, wherein the decellularized tissue engineered construct comprises a decellularized tissue engineered construct produced using human cells.

189. The construct of claim 182, wherein the decellularized tissue engineered construct comprises a decellularized tissue engineered construct produced using neonatal cells.

190. The construct of claim 182, wherein the decellularized tissue engineered construct comprises a decellularized tissue engineered construct produced using genetically transformed cells.

191. The construct of claim 182, wherein the decellularized tissue engineered construct comprises a decellularized tissue engineered construct produced using human cells.

192. The construct of claim 182, wherein the decellularized tissue engineered construct comprises a decellularized tissue engineered construct produced using cells selected from the group consisting of: smooth muscle cells, cardiac muscle cells, epithelial cells, endothelial cells, urothelial cells, fibroblasts, myoblasts, chondrocytes, chondroblasts, osteoblasts, osteoclasts, hepatocytes, bile duct cells, pancreatic islet cells, thyroid, parathyroid, adrenal, hypothalamic, pituitary, ovarian, testicular, salivary gland cells, adipocytes, and precursor cells.

193. The tissue engineered construct of claim 182, wherein the cells comprise cells harvested from an intended recipient of the construct.

194. The construct of claim 182, wherein the population of cells is cultured *in vitro* before the decellularized tissue engineered construct is seeded therewith.

195. The construct of claim 182, wherein the population of cells is selected from the group consisting of: smooth muscle cells, cardiac muscle cells, epithelial cells, endothelial cells, urothelial cells, fibroblasts, myoblasts, chondrocytes, chondroblasts, osteoblasts, osteoclasts, hepatocytes, bile duct cells, pancreatic islet cells, thyroid, parathyroid, adrenal, hypothalamic, pituitary, ovarian, testicular, salivary gland cells, adipocytes, and precursor cells.

196. The construct of claim 182, wherein the population of cells comprises cells of at least two different cell types.

197. The construct of claim 182, wherein the population of cells comprises neonatal cells.

198. The construct of claim 182, wherein the population of cells comprises human cells.

199. The construct of claim 182, wherein the decellularized tissue engineered construct is maintained for growth period under growth conditions suitable for the growth of the population of cells.

200. The construct of claim 182, wherein the decellularized tissue engineered construct comprises a decellularized tissue engineered construct that has been subjected to a mechanical force during a growth period.

201. The construct of claim 182, wherein the decellularized tissue engineered construct comprises a decellularized tissue engineered construct that has been subjected to a pulsatile stimulus during a growth period.

202. The construct of claim 182, wherein the decellularized tissue engineered construct comprises a decellularized construct that has been subjected to electrical stimulation during a growth period.

203. The construct of claim 182, wherein the decellularized tissue engineered construct comprises a decellularized tissue engineered construct that has been treated with a growth factor during a growth period.

204. The construct of claim 182, wherein the decellularized tissue engineered construct comprises a decellularized tissue engineered construct that has been exposed to serum during a growth period.

205. A method for treating a subject suffering from tissue damage or loss comprising:

implanting the construct of claim 182 into a subject in need thereof.

206. The method of claim 205, further comprising the step of:

treating the construct with a biologically active agent before the implanting step, whereby the construct serves as a vehicle for delivery of the biologically active agent to the subject.

207. The method of claim 205, further comprising the step of:

treating the construct with a biologically active agent before the implanting step, whereby the biologically active agent is selected to enhance recellularization or vascularization of the construct after the implanting step.

208. The method of claim 205, wherein the biologically active agent comprises a pharmaceutical composition.

209. The method of claim 205, wherein the biologically active agent is selected from the group consisting of: growth factors, adhesion factors, soluble extracellular matrix proteins, thrombomodulators, antibiotics, and agents that augment hemocompatibility.

210. The method of claim 205, wherein the implanting step comprises supplementing or replacing a blood vessel of the subject.

211. The method of claim 205, wherein the implanting step comprises supplementing or replacing a tissue of the subject, the tissue selected from the list consisting of: a heart valve, a muscle, a joint, a ligament, a tendon, a bone, and an organ.

212. A method for treating a subject suffering from tissue damage or loss comprising:

implanting the construct of claim 199 into a subject in need thereof.

213. The method of claim 212, further comprising the step of:

treating the construct with a biologically active agent before the implanting step, whereby the construct serves as a vehicle for delivery of the biologically active agent to the subject.

214. The method of claim 212, further comprising the step of:

treating the construct with a biologically active agent before the implanting step, whereby the biologically active agent is selected to enhance recellularization or vascularization of the construct after the implanting step.

215. The method of claim 212, wherein the biologically active agent comprises a pharmaceutical composition.

216. The method of claim 212, wherein the biologically active agent is selected from the group consisting of: growth factors, adhesion factors, soluble extracellular matrix proteins, thrombomodulators, antibiotics, and agents that augment hemocompatibility.

217. The method of claim 212, wherein the implanting step comprises supplementing or replacing a blood vessel of the subject.

218. The method of claim 212, wherein the implanting step comprises supplementing or replacing a tissue of the subject, the tissue selected from the list consisting of: a heart valve, a muscle, a joint, a ligament, a tendon, a bone, and an organ.